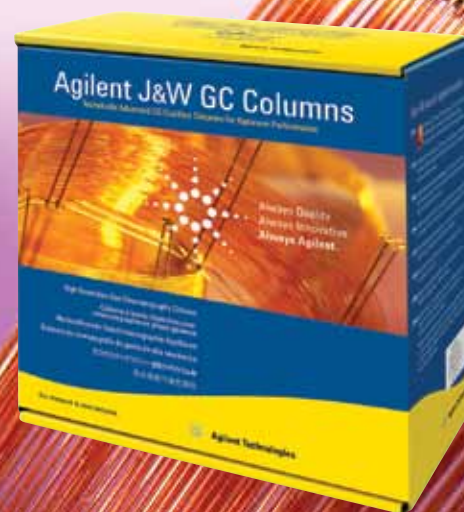


**Cut through  
the noise  
and stop worrying  
about peak tailing  
for active compounds**



Agilent J&W Ultra Inert and  
GC/MS GC Column Portfolio



# Agilent J&W Ultra Inert and GC/MS GC Columns minimize baseline elevation and peak tailing for active compounds and deliver a better bottom line



*Testing drinking water  
for semi-volatile contaminants  
that are public health threats*



*Detecting melamine and  
other dangerous substances  
in wheat gluten*



*Determining drugs of abuse  
for regulatory compliance*

In today's demanding lab environment, you're under intense pressure to deliver fast, accurate results while conforming to an increasingly regulatory landscape.

With all this in mind, you simply cannot afford interferences caused by column bleed or activity. For starters, having to repeat or verify suspect analyses wastes valuable resources, hinders productivity and hurts your bottom line. Even worse, unreliable results can have catastrophic implications in terms of environmental safety and the quality of the foods we eat.

## **Agilent J&W Ultra Inert and GC/MS GC columns can help you achieve the lowest possible detection limits for difficult analytes**

By itself, low column bleed increases the signal to noise ratio; however, your results will be flawed if *any* analyte is adsorbed by active sites in the column. Similarly, if a well-deactivated column has a high bleed rate, some of the analyte-generated signal could be smothered by the bleed signal. Again, your results will be flawed.

Only Agilent J&W Ultra Inert and GC/MS GC columns deliver low column bleed and low column activity for your sensitive, trace-level applications – regardless of detector type.

### **Benefits of high column inertness**

- Trace level detection of active compounds
- Minimum peak tailing for active analytes
- Longer maintenance-free instrument uptime
- Minimal compound loss and degradation for more accurate quantitation

### **Benefits of low column bleed**

- Improved mass spectral clarity and faster, more accurate peak identification
- Increase column lifetime at higher operating temperatures
- Less maintenance for GC detectors that are sensitive to bleed-related contamination
- Reduced baseline noise and interference
- Faster baseline stabilization and column exchange for shorter conditioning time and improved productivity

## Robust columns for demanding GC and GC/MS applications

Agilent J&W GC/MS columns deliver reliable performance and low column bleed – even at high temperatures – for a broad range of benign and difficult sample types.

These unique columns utilize special surface deactivation and siloxane chemistries that enhance the performance of siloxane polymers. They also adhere to tight quality control specifications for separation efficiency, retention characteristics, column bleed, and peak height ratio.

As a result of our stringent QC tests, you can be certain you're getting the highest column-to-column reproducibility and column performance for the widest range of compound types – including chemically active compounds.

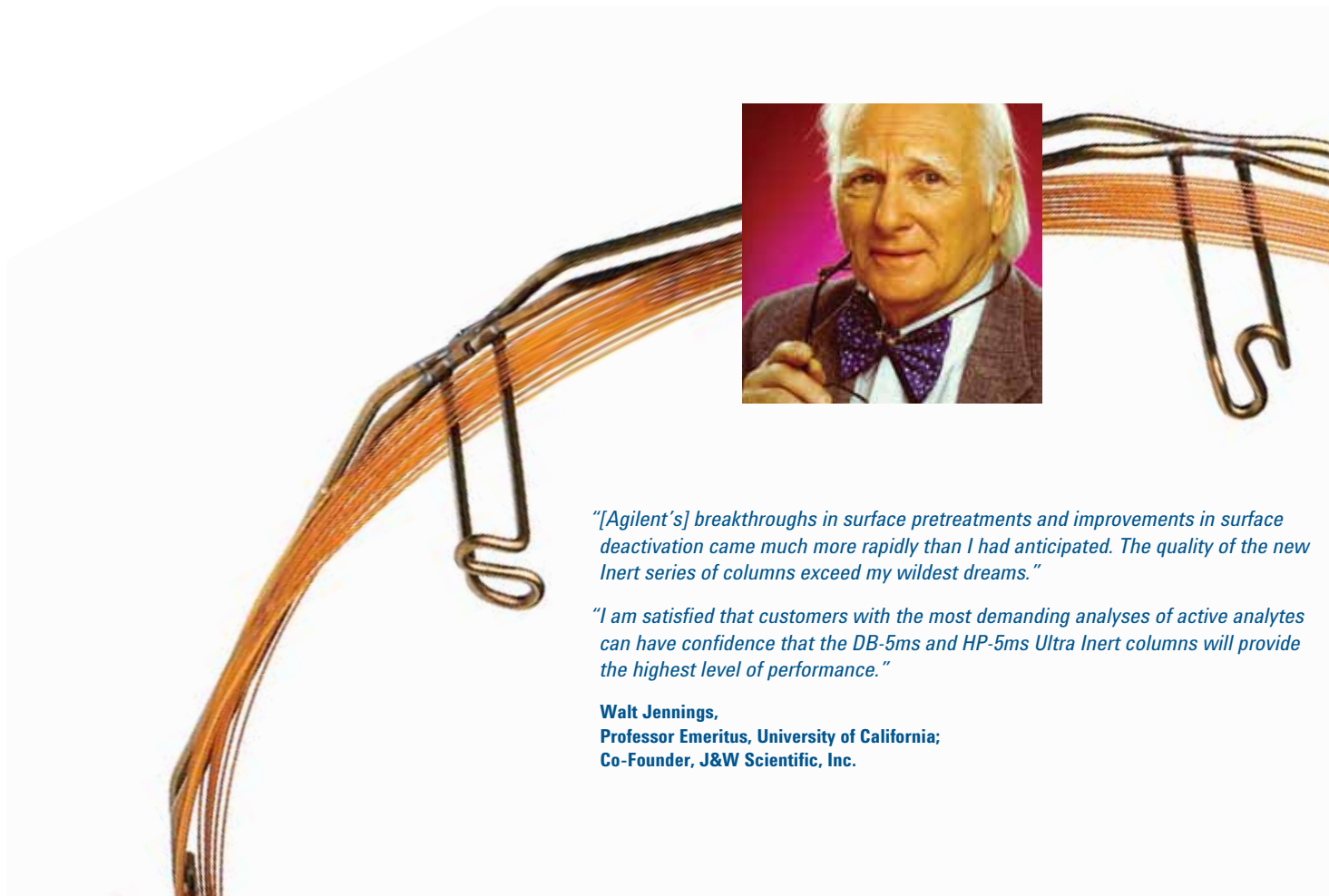
## Ultra Inert Columns: Same selectivity with improved column inertness for trace-level analysis of active compounds

In 2008, Agilent introduced a new breakthrough: Agilent J&W Ultra Inert GC columns. Ultra Inert columns feature superior column inertness while maintaining the *same selectivity* as their MS counterparts. So you don't have to waste time with method re-validation.

Like *all* Agilent columns, Ultra Inert GC columns undergo tight QC testing procedures. However, Ultra Inert columns must *also* pass through a more difficult set of test parameters, including:

- A demanding test probe mixture that contains compounds with low molecular weights, low boiling points, and no steric shielding of active functional groups. This allows the probative portion of the test molecule to penetrate and fully interact with the column's stationary phase and surface.
- Testing at lower isothermal temperatures (65° C vs. 120° C for GC/MS columns). Higher-temperature testing increases the kinetic energy of probes in the mobile phase, allowing molecules to sweep past active sites on the column. This can mask solute/column interactions. Conversely, lower test temperatures allow a true evaluation of column surface activity, ensuring consistent column inertness.

Together, these conditions enhance the opportunity for solute/column interactions, and expose column deficiencies that traditional GC/MS testing might not detect.



*"[Agilent's] breakthroughs in surface pretreatments and improvements in surface deactivation came much more rapidly than I had anticipated. The quality of the new Inert series of columns exceed my wildest dreams."*

*"I am satisfied that customers with the most demanding analyses of active analytes can have confidence that the DB-5ms and HP-5ms Ultra Inert columns will provide the highest level of performance."*

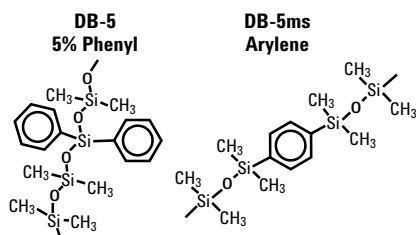
**Walt Jennings,**  
Professor Emeritus, University of California;  
Co-Founder, J&W Scientific, Inc.

# Optimized bonded phases maximize sensitivity and thermal stability

Together, Agilent's arylene phase technology and optimized siloxane manufacturing processes ensure excellent column performance for the broadest range of compounds, including chemically active analytes such as acids, bases and highly substituted compounds.

## Arylene phases

Arylene columns utilize special surface deactivations and siloxane chemistries, which enhance the chromatographic performance of siloxane polymers. The inclusion of arylene in the siloxane polymer strengthens the polymer backbone, reducing stationary phase degradation and column bleed.



Each arylene MS phase was designed to be virtually identical to its "parent" polymer, so selectivity differences are very subtle.

## Optimized siloxanes

DB-1 and HP-1 columns are 100% dimethylpolysiloxane. They *cannot be mimicked* by strengthening the polymer backbone through arylene inclusion, because the addition of other functional groups significantly changes phase selectivity.

Agilent developed the optimized siloxane column phase specifically to retain the selectivity of non-MS columns. This translates into improved deactivation and greatly reduced background level, even at elevated temperatures.

## Arylene phase columns

	DB-5ms Ultra Inert	DB-XLB	DB-35ms Ultra Inert	DB-17ms	DB-225ms
Phase	Arylene	Second generation arylene	Second generation arylene	Second generation arylene	Second generation arylene
Selectivity	Virtually identical to 5% phenyl-methylpolysiloxane	Unique selectivity. Slightly more polar than a 5% phenyl-methylpolysiloxane	Virtually identical to 35% phenyl-methylpolysiloxane	Virtually identical to 50% phenyl-methylpolysiloxane	Virtually identical to 50% cyano-propylphenyl-methylpolysiloxane
Polarity	Low	Low	Mid	Mid	Mid/High
Upper Temperature Limit	325/350° C same as DB-5	340/360° C	340/360° C compared to DB-35 300/320° C	320/340° C compared to DB-17 280/300° C	240° C compared to DB-225 220/240° C

Note: Good for all general applications, the DB-XLB's unique selectivity makes it the first choice for the GC/MS analysis of specific PCB congeners.

Note: DB-35ms UI and DB-XLB or DB-17ms and DB-XLB are also ideal for dual column ECD methods such as CLP pesticides, chlorinated herbicides, Aroclors, and haloacetic acids.

## Optimized siloxane columns (GC/MS and Ultra Inert)

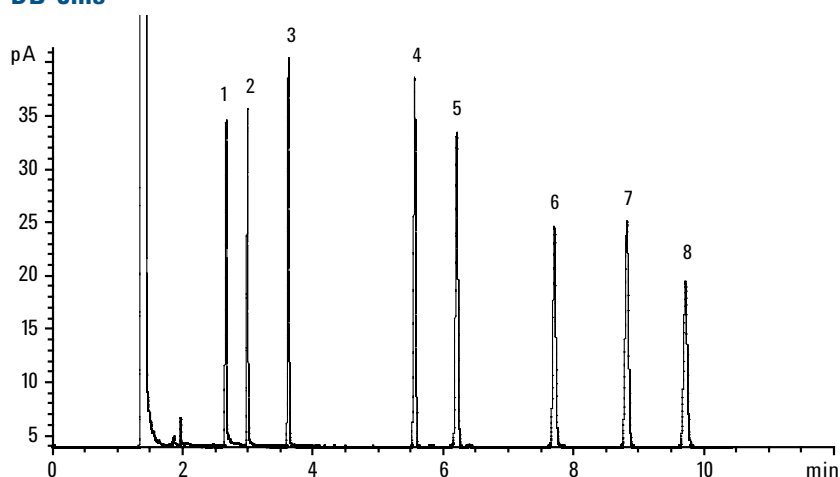
	DB-1ms Ultra Inert	HP-1ms Ultra Inert	HP-5ms Ultra Inert
Phase	100% Dimethylpolysiloxane	100% Dimethylpolysiloxane	5% phenyl Dimethylpolysiloxane
Selectivity	Exactly the same as DB-1	Exactly the same as HP-1	Exactly the same as HP-5
Upper Temperature Limit	340/360° C compared to DB-1 325/350° C	325/350° C same as HP-1	325/350° C same as HP-5

# Confidently analyze active compounds, trace level samples and unknowns **without changing selectivity**

Agilent's leading-edge manufacturing processes – combined with our optimization of chemistries and advancements in manufacturing equipment design – improve the inertness of our Ultra Inert columns while maintaining the selectivity of their DB- and HP-5ms, DB-1ms, and DB-35ms counterparts.

Here you can see that, compared to existing DB-5ms and DB-35ms columns, DB-5ms and DB-35ms Ultra Inert columns provide the same selectivity, so there is no need for method re-validation.

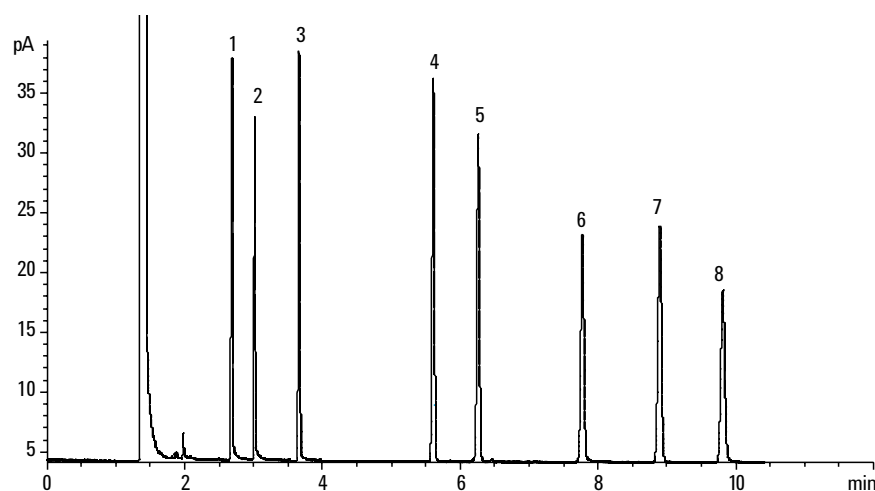
## DB-5ms



### Components

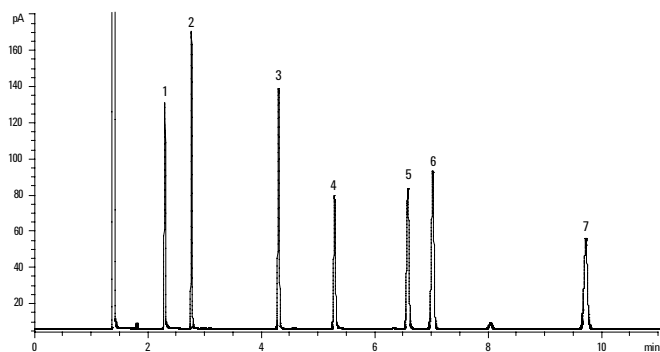
1. 2-Ethylhexanoic acid
2. 1,6-Hexanediol
3. 4-Chlorophenol
4. n-Tridecane
5. 1-Methylnaphthalene
6. 1-Undecanol
7. n-Tetradecane
8. Dicyclohexylamine

## DB-5ms Ultra Inert



# Set your sights on **ultimate reliability** for your routine and trace level analysis

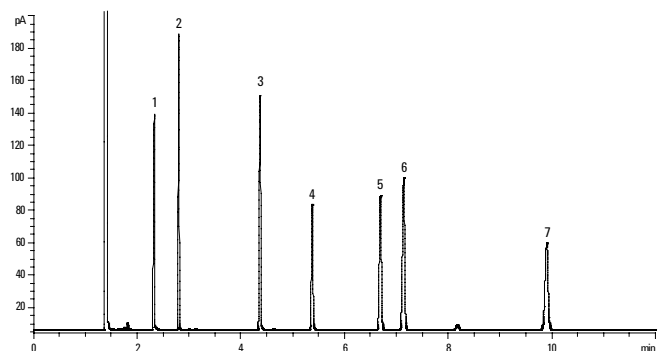
## DB-35ms



### Components:

1. Benzylamine
2. Tridecane
3. 4-Chlorophenol
4. Tetradecane
5. 1-Undecane
6. Pentadecane
7. Biphenyl
8. Hexadecane

## DB-35ms Ultra Inert



Every Agilent J&W Ultra Inert GC column is consistently tested using probes with varying chemical characteristics to avoid subtle polymer selectivity variations. This ensures that Ultra Inert GC columns have the same selectivity as Agilent MS columns – eliminating the need for method re-validation.

**DB-35ms Ultra Inert – a mid-polarity Ultra Inert stationary phase with the same selectivity as the DB-35ms currently used in your methods**

	1-Methylnaphthylene	1-Undecanol	Acenaphthylene	Biphenyl
DB-5ms	1324.8	1371.8		
DB-5ms UI	1324.9	1371.8		
DB-1ms		1355.2	1425.0	
DB-1ms UI		1355.5	1425.8	
DB-35ms		1449.7		1557.4
DB-35ms UI		1450.0		1557.9

# Put 40 years of Agilent quality and innovation behind your every separation

## Uncompromising standards ensure unbeatable column performance

At Agilent, we take column performance seriously. Our rigorous QC testing protocols ensure the highest column-to-column reproducibility for the widest range of analytes and conditions. For example:

- **Maximum reproducibility.** Every Agilent J&W Ultra Inert and GC/MS columns are *individually tested* for low column bleed, consistent selectivity, accurate column dimensions, superior inertness, and high efficiency – the proof is the Performance Summary Sheet shipped with every column. You can be sure of minimal method adjustment when changing columns.
- **Better precision and reliability.** All columns must adhere to tight retention factor (k) specifications and narrow retention indexes to ensure reproducible peak separation from column to column.
- **More accurate quantification.** A high number of theoretical plates per meter promotes narrow peaks and improves the resolution of closely eluting peaks.
- **Improved signal-to-noise ratios.** We are constantly developing new ways to reduce column bleed and activity, so you can minimize background noise and maximize sensitivity.
- **Better peak shape for challenging active compounds.** We measure peak height ratios or peak tailing factors for active compounds such as acids and bases to ensure excellent peak shape for a broad range of difficult-to-chromatograph compounds.



Agilent has utilized over four decades of GC/MS column manufacturing experience to design innovative new phases for today's trace-analysis applications.

## Over 40 years of Agilent innovation

- **1974:** Capillary GC Pioneer, Walt Jennings, co-founds J&W Scientific. J&W Scientific introduces the first all glass capillary bonded-phase, quickly establishing an industry standard.
- **1979:** Agilent, while a part of HP, invents fused silica capillary columns for gas chromatography, a breakthrough in flexibility and inertness. Also that year: J&W Scientific creates the first crossed-linked bonded stationary phase.
- **1991:** J&W Scientific introduces DB-5ms – the first commercial GC column stationary phase with lower column bleed using arylene technology.
- **1992:** Agilent, while a part of HP, introduces HP-5ms columns, further raising the bar on low-bleed performance.
- **1998:** Varian introduces the first bonded PLOT (PoraBOND) column, offering a stable bonded PLOT stationary phase for spike-free chromatography.
- **2000:** Agilent acquires J&W Scientific to unite the DB and HP column families, creating Agilent J&W GC Columns.
- **2008:** Agilent introduces Ultra Inert columns, setting a new standard for column inertness and QC testing with the industry's most rigorous test mixture. Agilent also acquires RVM Scientific and introduces patented LTM Technology.
- **2010:** Agilent acquires Varian, making Agilent J&W GC columns the most extensive and innovative GC column offering in the industry.

Watch Agilent's commitment to quality in action! View a virtual tour at [www.agilent.com/chem/myGCColumns](http://www.agilent.com/chem/myGCColumns)

# The industry's most rigorous test probe mixture ensures consistent **column inertness – and results**

A strong test probe mixture can highlight deficiencies in column activity, while a weak mixture can actually mask such deficiencies.

That is why the test probes in **Agilent's Ultra Inert test probe mixture** have low molecular weights, low boiling points and no steric shielding of their active groups. These characteristics allow the probative portion of the test molecules to penetrate – and fully interact with – the stationary phase and column surface.

## Less Demanding Test Probe Mixture Components

- |                       |                        |                    |
|-----------------------|------------------------|--------------------|
| 1. 1-Octanol          | 4. 2,6-Dimethylaniline | 7. 1-Decanol       |
| 2. n-Undecane         | 5. n-Dodecane          | 8. n-Tridecane     |
| 3. 2,6-Dimethylphenol | 6. Naphthalene         | 9. Methyldecanoate |

## Agilent's New, More Demanding Ultra Inert Test Probe Mixture for 5ms, 1ms, and 35ms Columns

### 5ms Columns

Elution Order	Test Probe	Functional Test
1	1-Propionic acid	Basicity
2	1-Octene	Polarity
3	n-Octane	Hydrocarbon marker
4	4-Picoline	Acidity
5	n-Nonane	Hydrocarbon marker
6	Trimethyl phosphate	Acidity
7	1,2-Pentandiol	Silanol
8	n-Propylbenzene	Hydrocarbon marker
9	1-Heptanol	Silanol
10	3-Octanone	Polarity
11	n-Decane	Hydrocarbon marker

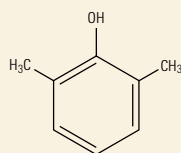
### 1ms Columns

Elution Order	Test Probe	Functional Test
1	1-Propionic acid	Basicity
2	1-Octene	Polarity
3	n-Octane	Hydrocarbon marker
4	1,2-Butanediol	Silanol
5	4-Picoline	Acidity
6	Trimethyl phosphate	Acidity
7	n-Propylbenzene	Hydrocarbon marker
8	1-Heptanol	Silanol
9	3-Octanone	Polarity
10	tert-Butylbenzene	Hydrocarbon marker
11	n-Decane	Hydrocarbon marker

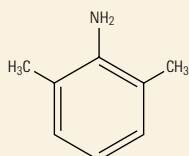
### 35ms Columns

Elution Order	Test Probe	Functional Test
1	1-Octene	Polarity
2	1-Butyric acid	Basicity
3	n-Nonane	Hydrocarbon marker
4	4-Picoline	Acidity
5	n-Propylbenzene	Polarity
6	1-Heptanol	Silanol, Polarity
7	1,2-Pentandiol	Silanol
8	3-Octanone	Polarity
9	Trimethyl phosphate	Acidity
10	n-Undecane	Hydrocarbon marker
11	tert-Butylbenzene	Efficiency

## Chemical Structures

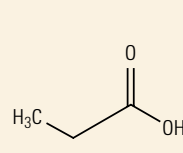


2, 6-Dimethylphenol

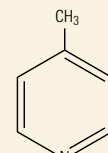


2, 6-Dimethylaniline

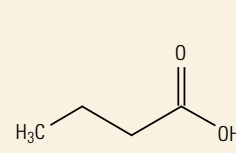
**Weak probe molecules:** The acidic and basic portions of these molecules are shielded by the two methyl groups on their phenyl rings, making them less probative.



1-Propionic acid



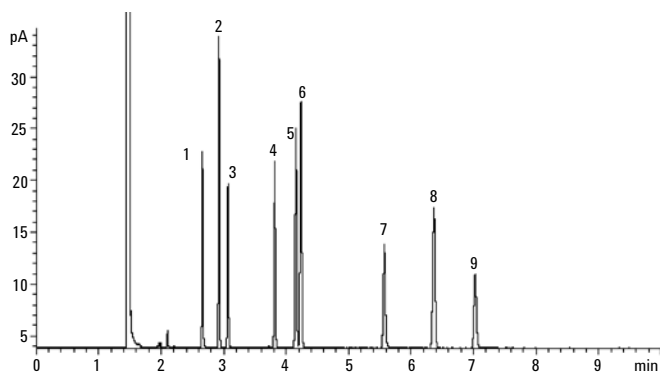
4-Picoline



1-Butyric acid

**Strong probe molecules:** The probes in Agilent's Ultra Inert test probe mixture are highly probative of the stationary phase and surface. Note, too, that the active end of each compound is available to interact with any active sites on the column.

## Less Demanding Test Probe Mixture

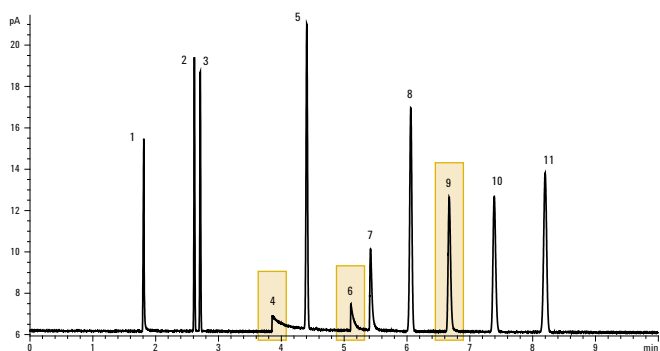


**Figure 1:** Here you can see the separation of a series of probes that are undemanding by today's standards (see 'Less Demanding Test Probe Mixture Compounds,' page 8) – and which are used by many GC column manufacturers.

## Experimental Conditions for Figure 1:

GC	Agilent 6890N
Sampler	Agilent 7683B, 5 $\mu$ L syringe (Agilent Part No. 5181-1273), 1.5 $\mu$ L split injection, 4 ng each component on column
Carrier	Hydrogen, constant pressure, 38 cm/s
Inlet	Split/splitless; 250° C, 1.4 ml/min; column flow, split flow 75 ml/min
Inlet Liner	Deactivated single taper with glass wool (Agilent Part No. 5183-4647)
Column	5%-Phenyl column 30 m x 0.25 mm x 0.25 $\mu$ m (competitor column)
Oven	120° C isothermal
Detector	FID at 325° C; 450 ml/min air, 40 ml/min hydrogen, 45 ml/min nitrogen makeup

## Agilent's Ultra Inert Test Probe Mixture



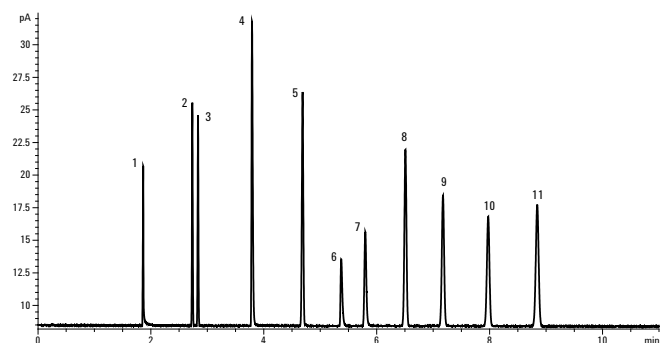
**Figure 2:** When the competitive column in Figure 1 was evaluated with Agilent's new Ultra Inert test probe mixture, very poor performance was observed for both the 4-picoline and the trimethylphosphate (peaks 4 and 6, respectively). There was also increased tailing of the 1,2-pentanediol (Peak 9), indicating poor deactivation or possible oxygen damage to the stationary phase.

Contrary to the results of the QC test in Figure 1, this column would not perform well with demanding analytes and would fail Agilent's new column inertness QC testing.

## Experimental Conditions for Figure 2 and 3:

GC	Agilent 6890N
Sampler	Agilent 7683B, 0.5 $\mu$ L syringe (Agilent Part No. 5188-5246), 0.02 $\mu$ L split injection
Carrier	Hydrogen, constant pressure, 38 cm/s
Inlet	Split/splitless; 250° C, 1.4 ml/min; split column flow 900 ml/min; gas saver flow 75 ml/min at 2.0 min
Inlet Liner	Deactivated single taper with glass wool (Agilent Part No. 5183-4647)
Column 1 (Figure 2)	5%-Phenyl column 30 m x 0.25 mm x 0.25 $\mu$ m (competitor column)
Column 2 (Figure 3)	DB-5ms Ultra Inert 30 m x 0.25 mm x 0.25 $\mu$ m (Agilent Part No. 122-5532UI)
Oven	65° C isothermal
Detection	FID at 325° C; 450 ml/min air, 40 ml/min hydrogen, 45 ml/min nitrogen makeup

## Ultra Inert Test Probe on DB-5ms Ultra Inert



**Figure 3:** A properly deactivated DB-5ms Ultra Inert column delivers symmetrical peak shapes, along with increased peak heights, which allow for accurate integration and detection of trace analytes.

Peak tailing or lost response of the acids indicates that the column is basic; conversely, poor peak behavior of the bases confirms that the column is acidic. The alcohol uncovers any oxygen damage or exposed silanols. If the peak shapes for all of these compounds are symmetrical, then the column is considered to be inert toward them.

To learn more about our groundbreaking test probe mixture, go to [www.agilent.com/chem/ultrainert](http://www.agilent.com/chem/ultrainert)

# Raising the bar on **consistent column inertness** and **exceptionally low column bleed**

By itself, low column bleed increases the signal-to-noise ratio; however, your results will be flawed if *any* analyte is adsorbed by active sites on the column. Similarly, if a well-deactivated column has a high bleed rate, some of the analyte-generated signal could be smothered by the bleed signal. Again, your results will be flawed.

## The Agilent J&W Ultra Inert GC Column family, the 1ms, 5ms, and 35ms, provide both low bleed and low activity for the most reliable results

If your GC column lacks inertness, active compounds such as acids, bases, phenols, or pesticides, will exhibit severe peak tailing, which can lead to inaccurate quantification. Even worse, the column might “eat up” the compounds you are trying to analyze, resulting in false negatives when screening for unknown samples.

But with Ultra Inert GC columns, introduced in 2008, you can count on:

- **The industry’s highest degree of column inertness** for sharper peaks, better signal-to-noise ratios and longer column life
- **The lowest column bleed in the business** for increased detector sensitivity, faster baseline stabilization and reduced instrument downtime
- **Minimal compound adsorption** for more accurate quantification
- **Superior column-to-column consistency** for improved productivity and reliable, reproducible results

In addition, our new Ultra Inert phase lets you perform trace-level analysis on a greater number of active compounds – including pesticides, flavors and fragrances, drugs of abuse, and unknown sample screening.

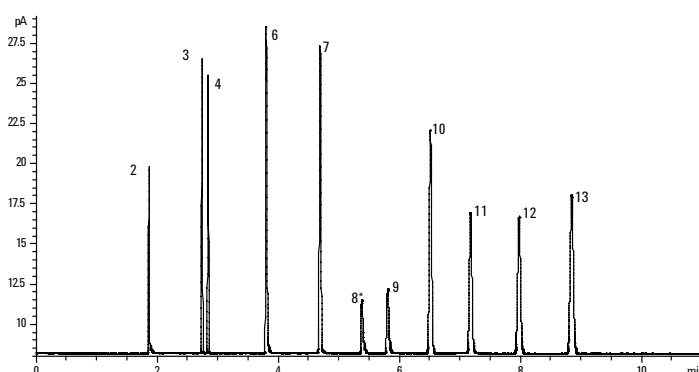
## A new era of column inertness QC testing

Like all Agilent columns, Ultra Inert GC columns must pass through the tightest quality control checkpoints for column bleed, theoretical plate efficiency and retention index.

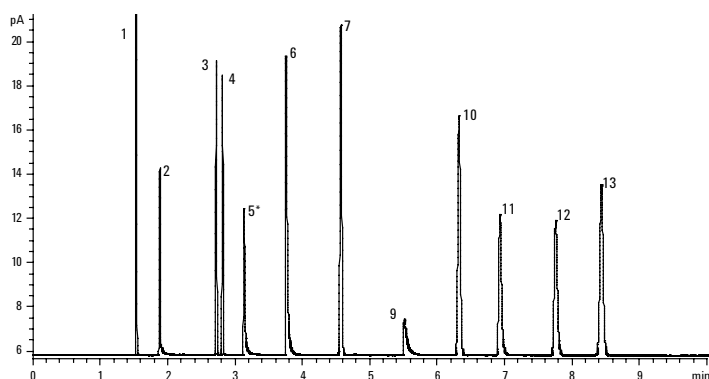
But we don’t stop there. *All* Agilent J&W Ultra Inert GC columns are also individually tested against Agilent’s exclusive Ultra Inert test probe mixture, so you know they can meet the demands for inertness that today’s applications require.

## A side-by-side comparison: Agilent vs. a leading competitor

### Agilent, DB-5ms Ultra Inert Agilent Part No. 122-5532UI



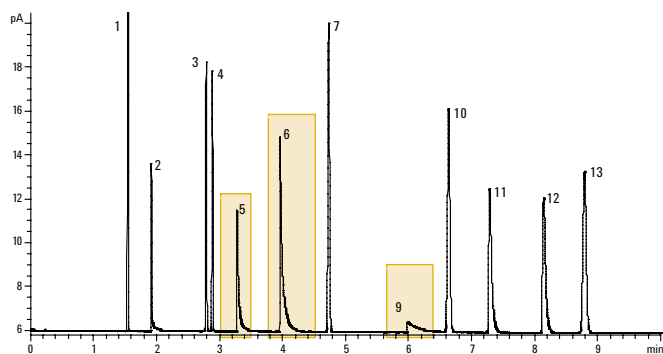
### Agilent, HP-5ms Ultra Inert Agilent Part No. 19091S-433UI



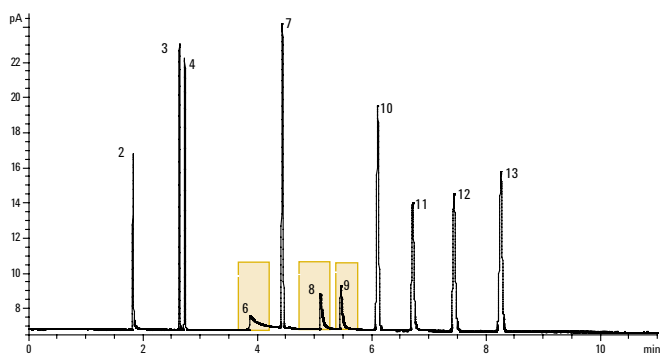
Experimental conditions are listed on the following page.

## Competitive 5ms columns just don't make the grade – and these examples prove it

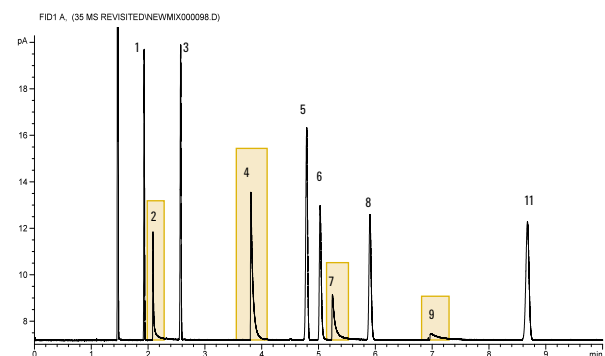
### Restek, Rxi-5ms (similar to HP-5ms Ultra Inert)



### Restek, Rtx-5Sil MS (similar to DB-5ms Ultra Inert)



### Rxi-35Sil MS (similar to DB-35ms Ultra Inert)



Agilent J&W Ultra Inert GC columns significantly reduce peak tailing and test probe adsorption for these challenging analytes.

Note that the competitors' peaks (highlighted) show severe tailing, resulting in reduced analyte sensitivity. When you compare these poor peaks with the sharp peaks produced by the Agilent columns, it becomes clear that Agilent low-bleed columns are also the most inert.

### Experimental Conditions:

GC	Agilent 6890N
Sampler	Agilent 7683, 0.5 µL syringe (Agilent Part No. 5188-5246), 0.02 µL injection
Carrier	Hydrogen (38 cm/sec)
Inlet	Split/splitless; 250° C, split flow 900 mL/min, gas saver flow 75 mL/min at 2 minutes; 1 ng each component on-column
Inlet Liner	Deactivated single taper w/ glass wool (Agilent Part No. 5183-4647); gold-plated seal with cross (Agilent Part No. 5182-9652)
Column	30 m x 0.25 mm x 0.25 µm
Oven	65° C isothermal
Detection	FID

### Ultra Inert Test Probe Mixture (For 5ms columns)

1. Methylene Chloride (solvent)	6. 4-Picoline	10. n-Propylbenzene
2. 1-Propionic acid	7. n-Nonane	11. 1-Heptanol
3. 1-Octene	8. 1,2-Pentenediol*	12. 3-Octanone
4. n-Octane	9. Trimethyl phosphate	13. n-Decane
5. 1,3-Propanediol*		

\*Due to differences in selectivity between DB-5ms Ultra Inert and HP-5ms Ultra Inert, 1,2-Pentenediol has been replaced by 1,3-Propanediol in the HP-5ms Ultra Inert test probe mixture.

### Experimental Conditions:

75 °C isothermal  
 Split: 900 mL total flow  
 0.02 µL injection  
 DB-35ms UI test mixture  
 ~1.3 min hold-up time

### Compounds

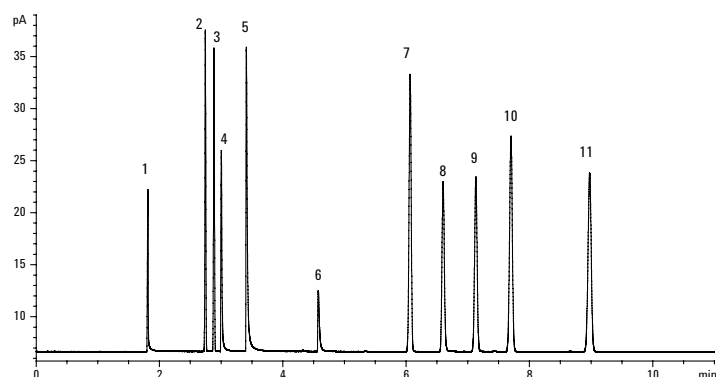
1. 1-Octene	7. 1,2-pentenediol
2. Butyric acid	8. 3-Octanone
3. n-Nonane	9. Trimethylphosphate
4. 4-Picoline	10. n-Undecane
5. n-Propylbenzene	11. n-Butylbenzene
6. 1-Heptanol	

# See how Agilent 1ms Ultra Inert GC Columns **clearly** surpass the leading competitors' 1ms columns

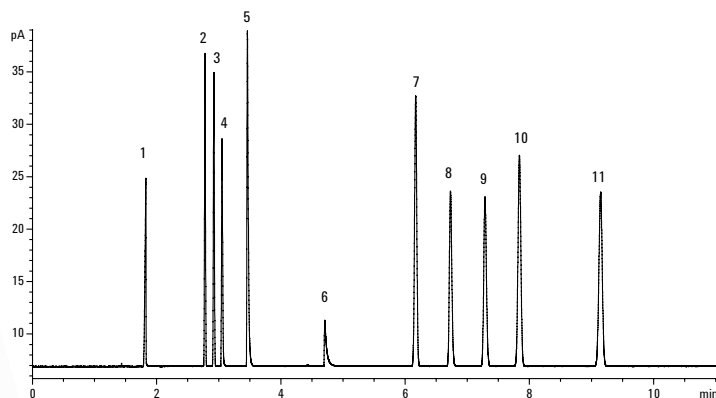
For this comparison, we used Agilent's challenging **Ultra Inert 1ms test probe mixture**. Note how Agilent 1ms Ultra Inert GC columns significantly reduce peak tailing and test probe adsorption, while improving bleed performance.

## Agilent vs. two leading competitors

**Agilent, DB-1ms Ultra Inert** Agilent Part No. 122-0132UI



**Agilent, HP-1ms Ultra Inert** Agilent Part No. 19091S-933UI

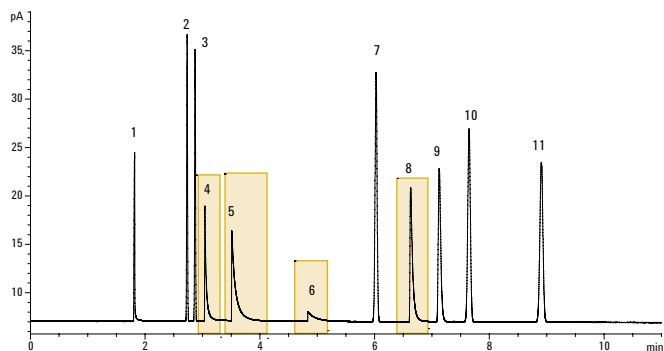


*Experimental conditions are listed on the following page.*



## Phenomenex ZB-1ms

(Similar to DB-1ms/HP-1ms Ultra Inert)

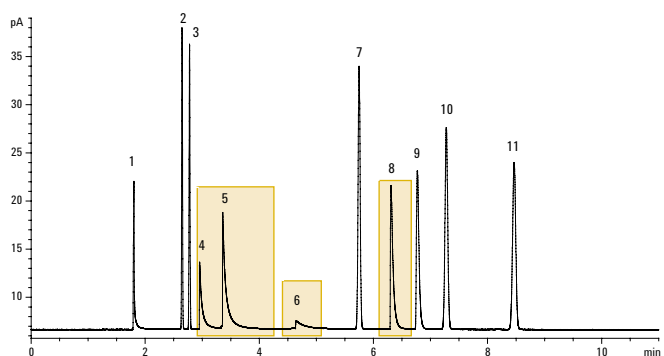


### Experimental Conditions:

GC	Agilent 6890N
Sampler	Agilent 7683, 0.5 µL syringe (Agilent Part No. 5188-5246), 0.02 µL injection
Carrier	Hydrogen (40 cm/sec)
Inlet	Split/splitless; 250° C, split flow 900 mL/min, gas saver flow 75 mL/min at 2 minutes; 2 ng each component on-column
Inlet Liner	Deactivated single taper w/ glass wool (Agilent Part No. 5183-4647); gold-plated seal with cross (Agilent Part No. 5182-9652)
Column	30 m x 0.25 mm x 0.25 µm
Oven	65° C isothermal
Detection	FID

## GL Sciences InertCap 1ms

(Similar to DB-1ms/HP-1ms Ultra Inert)

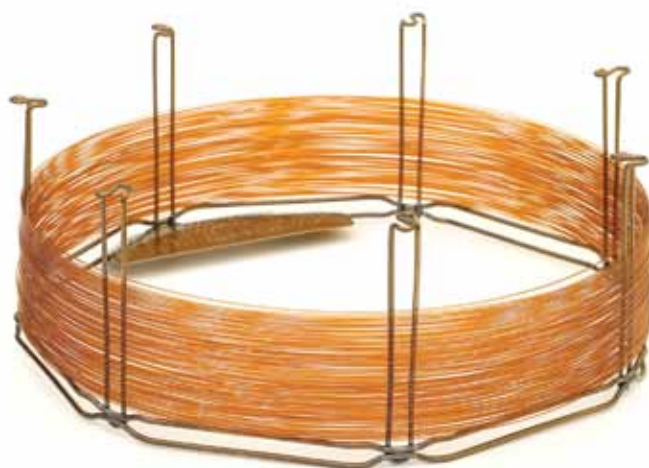


### Ultra Inert Test Probe Mixture (for 1ms columns)

- |                        |                               |
|------------------------|-------------------------------|
| 1. 1-Propionic acid    | 7. n-Propylbenzene            |
| 2. 1-Octene            | 8. 1-Heptanol                 |
| 3. n-Octane            | 9. 3-Octanone                 |
| 4. 1,2-Butanediol      | 10. <i>tert</i> -Butylbenzene |
| 5. 4-Picoline          | 11. n-Decane                  |
| 6. Trimethyl phosphate |                               |

The highlighted peaks show severe peak tailing and compound adsorption, both of which can lead to reduced sensitivity and false analytical results for these challenging active analytes.

Compared to competitive columns, Agilent J&W 1ms Ultra Inert columns provide better peak shape, greater signal-to-noise ratio and minimal compound loss, ensuring reliable peak identification and accurate quantitation.



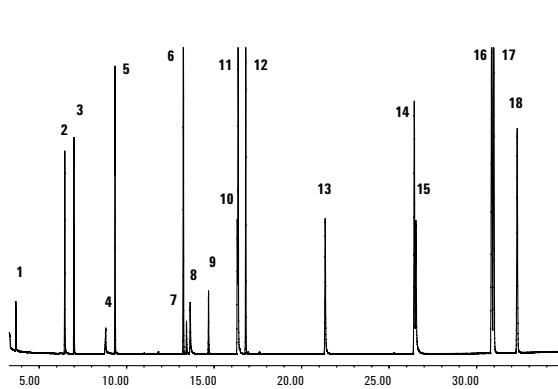
# The proof is in the performance

These real-world separations demonstrate how Agilent J&W Ultra Inert columns put even “impossible” analyses well within your reach.

**Semi-volatile analysis** using methods similar to US EPA Method 8270 is becoming increasingly important in environmental laboratories worldwide. Acidic compounds such as benzoic acid or 2,4-dinitrophenol – along with strong bases such as pyridine or benzidine – are examples of active species found in the semi-volatile sample set.

## US EPA Method 8270 Short Mix DB-5ms Ultra Inert (30 m x 0.25 mm x 0.25 µm) Agilent Part No. 122-5532UI

1. N-nitrosodimethylamine
2. Aniline
3. 1,4 dichlorobenzene-D4
4. Benzoic acid
5. Naphthalene- D8
6. Acenaphthene-D10
7. 2,4-dinitrophenol
8. 4-nitrophenol
9. 2-methyl-4,6-dinitrophenol
10. Pentachlorophenol
11. 4-aminobiphenyl
12. Phenanthrene- D10
13. Benzidine
14. Chrysene-D12
15. 3,3'-dichlorobenzidine
16. Benzo [b] fluoranthene
17. Benzo [k] fluoranthene
18. Perylene-D12



Here, we injected a “short mix” of the most active analytes in a semi-volatile set to demonstrate application-specific column inertness.

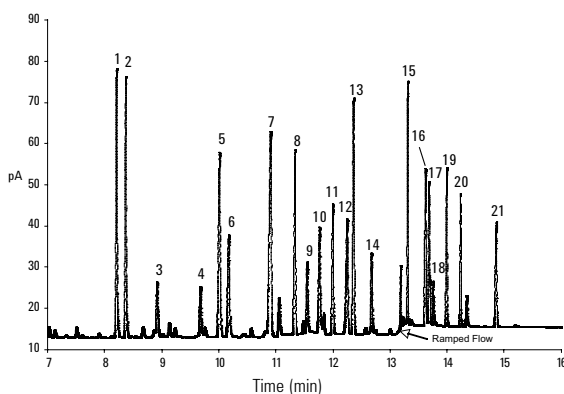
### Experimental Conditions:

GC	Agilent 6890N/5975B MSD
Sampler	Agilent 7683B, 5.0 µL syringe (Agilent Part No. 5188-5246) 1.0 µL splitless injection, 5 ng each component on column
Carrier	Helium constant flow 30 cm/s
Inlet	Split/splitless; 260° C, 53.7 ml/min. total flow, purge flow 50 ml/min. on at 0.5 min., gas saver flow 80 ml/min. on at 3.0 min.
Inlet Liner	Direct Connect Single Taper Deactivated Inlet Liner, (Agilent Part No. G1544-80730)
Column	DB-5ms Ultra Inert 30 m x 0.25 mm x 0.25 µm (Agilent Part No. 122-5532UI)
Oven	40° C (1 min) to 100° C (15° C/min), 10° C to 210° C (1 min), 5° C/min. to 310° C (8 min)
Detection	MSD source at 300° C, quadrupole at 180° C, transfer line at 290° C, full scan m/z 50-550

**Analysis of benzodiazepines and other drugs** is particularly challenging because of their high level of activity. For this reason, all aspects of the sample path – particularly the GC Column – must be as inert as possible.

## Benzodiazepines DB-5ms Ultra Inert (30 m x 0.25 mm x 0.25 µm) Agilent Part No.122-5532UI

1. Medazepam
2. Halazepam
3. Oxazepam
4. Lorazepam
5. Diazepam
6. Desalkyl Aurazepam
7. Nordazepam
8. Clonazam
9. Oxazepam
10. Temazepam
11. Flunitrazepam
12. Bromazepam
13. Prazepam
14. Lormetazepam
15. Nitrazepam
16. Chlordiazepoxide
17. Clonazepam
18. Demoxepam
19. Estazolam
20. Alprazolam
21. Triazolam



Agilent J&W Ultra Inert columns provide superior inertness for these demanding analytes, as this chromatogram demonstrates.

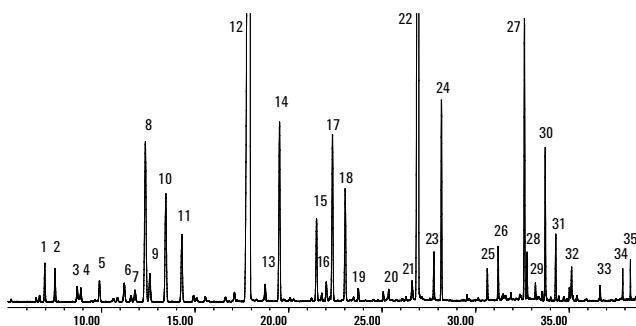
### Experimental Conditions:

Column	DB-5ms Ultra Inert Agilent Part No.122-5532UI 30 m x 0.25 mm x 0.25 µm
Carrier	Hydrogen, 53 cm/sec, constant flow
Flow Program (mL/min)	1.6 for 11 min 1.6 to 2.4 at 60 mL/min <sup>2</sup> hold 2 min 2.4 to 5.0 at 50 mL/min <sup>2</sup> hold 9 min
Oven	170° C for 3.2 min 170-250° C at 24.7° C/min, hold 5.3 min 250-280° C at 18.6° C/min, hold 4.0 min 280-325° C at 50.0° C/min, hold 4 min
Injection	Pulsed Splitless, 280° C 20 psi pulse pressure for 0.38 min 50 mL/min purge at 0.40 min Direct Connect liner G1544-80730
Detector	FID, 350° C
Sample	1 µL of 5-10 ppm

ISO 3515 standards for lavender oil include minimum and maximum percentages of thirty-five natural components.

### Lavender Oil Agilent J&W DB-1ms Ultra Inert (30 m x 0.25 mm x 0.25 µm) Agilent Part No. 122-0132UI

- |                        |                         |
|------------------------|-------------------------|
| 1. α Pinene            | 19. hexyl butyrate      |
| 2. Camphene            | 20. cumic aldehyde      |
| 3. 1-Octen-3-ol        | 21. cis Geraniol        |
| 4. 3-Octanone          | 22. Linalool acetate    |
| 5. β Myrcene           | 23. Borneol acetate     |
| 6. 3-Carene            | 24. lavandulyl acetate  |
| 7. α-Cymene            | 25. Nerol acetate       |
| 8. Eucalyptol          | 26. Geranyl acetate     |
| 9. D Limonene          | 27. Caryophyllene       |
| 10. β Trans-Ocimene    | 28. α-Santolene         |
| 11. β Cis-Ocimene      | 29. α-Bergamotene       |
| 12. β Linalool         | 30. β Farnesene         |
| 13. Octen-1-ol acetate | 31. Germacrene D        |
| 14. Camphor            | 32. γ Cardinene         |
| 15. Borneol            | 33. Caryophyllene oxide |
| 16. Lavandulol         | 34. tau Cardinol        |
| 17. Terpine-4-ol       | 35. α Bisabolol         |
| 18. α Terpinol         |                         |



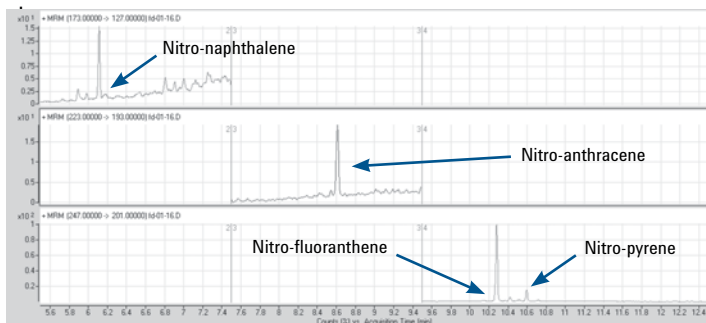
In this example, a total of 35 components were successfully identified using Agilent DB-1ms Ultra Inert GC columns.

#### Experimental Conditions:

Sample	Lavender Oil 1:20 in acetone
Column	Agilent J&W DB-1ms Ultra Inert 30 m x 0.25 mm x 0.25 µm (Agilent Part No. 122-0132UI)
Carrier	He 40 cm/sec constant flow
Oven	62° C (12.5min) to 95° C (3° C/min), 5° C/min to 165° C, 100° C/min to 310° C (2.5 min)
Inlet	250° C 1 µl injection, split 200:1, gas saver 50 ml/min on at 2.0 minutes
MSD	300° C source, 180° C quad, 280° C transfer line temperatures scanning mode

### MRM chromatograms of nitro-PAHs in an extract of urban air particulate sample.

Agilent J&W DB-5ms Ultra Inert (15 m x 0.25 mm x 0.25 µm) Agilent Part No. 122-5512UI.



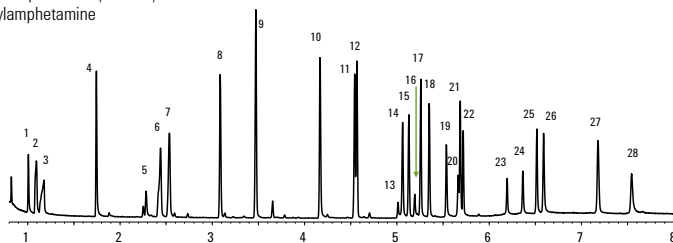
The concentrations for nitro-naphthalene, nitro-anthracene, nitro-fluoranthene and nitro-pyrene are 21 pg/m<sup>3</sup>, 10 pg/m<sup>3</sup>, 77 pg/m<sup>3</sup> and 14 pg/m<sup>3</sup>, respectively

**Column: Agilent J&W DB-5ms Ultra Inert 15 m x 0.25 mm x 0.25 µm (Agilent Part No. 122-5512UI).** In this example, 1ms Ultra Inert columns, together with the Agilent 7000A Triple Quadrupole GC/MS system, allowed a reliable determination of trace-level nitro-PAHs in this complex matrix – without labor-intensive sample preparation. Note that solutes were selectively detected at the pg/µL level, which corresponds to pg/m<sup>3</sup> in air.

### 5 ng Test Mix: DB-35ms Ultra Inert Fast Toxicology Analyzer

Agilent J&W DB-35ms Ultra Inert (15 m x 0.25 mm x 0.25 µm) Agilent Part No. 122-3812UI

- |                                       |                          |                      |                |
|---------------------------------------|--------------------------|----------------------|----------------|
| 1. Amphetamine                        | 14. Tetrahydrocannabinol | 19. Oxycodone        | 24. Clonazepam |
| 2. Phentermine                        | 15. Codeine              | 20. Temazepam        | 25. Alprazolam |
| 3. Methamphetamine                    | 16. Lorazepam            | 21. Diacetylmorphine | 26. Verapamil  |
| 4. Nicotine                           | 17. Diazepam             | 22. Flunitrazepam    | 27. Strychnine |
| 5. Methylenedioxyamphetamine(MDA)     | 18. Hydrocodone          | 23. Nitrazepam       | 28. Trazodone  |
| 6. Methylenedioxyethamphetamine(MDMA) |                          |                      |                |
| 7. Methylenedioxyethylamphetamine     |                          |                      |                |
| 8. Meperidine                         |                          |                      |                |
| 9. Phencyclidine                      |                          |                      |                |
| 10. Methadone                         |                          |                      |                |
| 11. Cocaine                           |                          |                      |                |
| 12. SKF-525a<br>(RTL Compound)        |                          |                      |                |
| 13. Oxazepam                          |                          |                      |                |



Example NPD chromatogram of un-derivatized drugs of abuse 5 ng/component on an Agilent J&W DB-35ms UI column fast screening conditions listed in Table 1. Component number 12 is used for retention time locking in the de-convolution reporting software data base.

**Table 1. Instrument Conditions  
Fast Screening DB-35ms Ultra Inert**

Carrier:	Helium fixed pressure 35.0 PSI
Inlet:	Splitless 1 µl 280° C, total flow 56.4 ml/min switched septum purge, gas saver off, 50 ml/min after 0.4 minutes
Sample:	Agilent GC/MS Toxicology Checkout Mixture (Agilent Part No. 5190-0471)
Inlet Liner:	dual taper deactivated (Agilent Part No. 5181-3315)
Column:	Agilent J&W DB-35ms Ultra Inert 15m x 0.25mm x 0.25µm (Agilent Part No. 122-3812UI) 35 PSI constant pressure mode
Back-flush:	Post run: 1 min. 1 PSI inlet, 75 PSI aux EPC
Oven:	100° C (0.25 min) to 345° C (40° C/min, 2.25 min hold)
MSD:	Transfer line 300° C, source 300° C, quadrupole 180° C scan mode
NPD:	Blos bead 300° C H <sub>2</sub> 3 ml/min, 60 ml/min air, 11 ml/min makeup + col flow
CFT Device:	2-Way splitter with solvent venting between MSD and NPD.

For additional proof chromatograms, go to  
[www.agilent.com/chem/ultrainert](http://www.agilent.com/chem/ultrainert)

# The “Agilent Advantage” extends to our standard MS columns

If you do not work with trace samples or active compounds, you may not need the added inertness of Agilent J&W Ultra Inert GC columns. For you, Agilent J&W GC/MS columns are the most reliable choice.

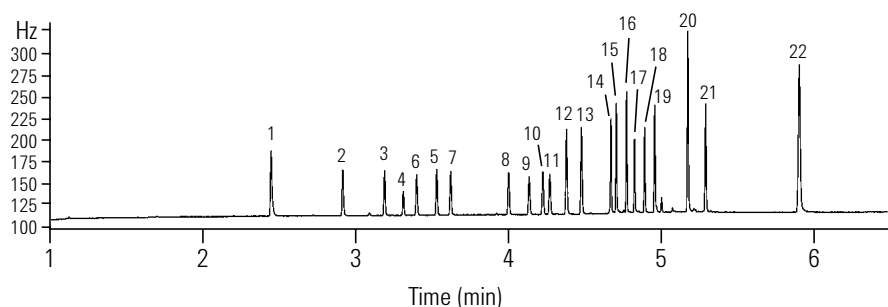
Like our Ultra Inert GC columns, every Agilent J&W GC/MS column must meet consistently rigid performance criteria, such as tight retention factor (k) specifications, narrow retention indexes, and a high number of theoretical plates per meter.

We also *individually* test every column to ensure maximum reproducibility with minimal adjustment when you change columns.

It all adds up to supreme confidence in your qualitative and quantitative results, especially for difficult-to-chromatograph compounds.

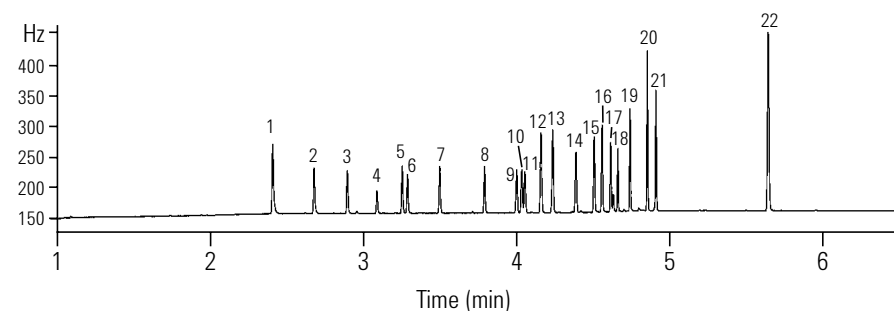
## A direct column-performance comparison: Rapid CLP (Contract Laboratory Program) Pesticide Analysis

**Agilent, DB-17ms primary column** Agilent Part No. 121-4722



**Agilent’s DB-17ms primary analysis column** resolved all 22 peaks of interest in less than 6 minutes with sharp symmetry and minimal baseline drift. Conversely, Restek’s primary analysis column resolved only 20 of 22 peaks – and displayed evidence of peak tailing.

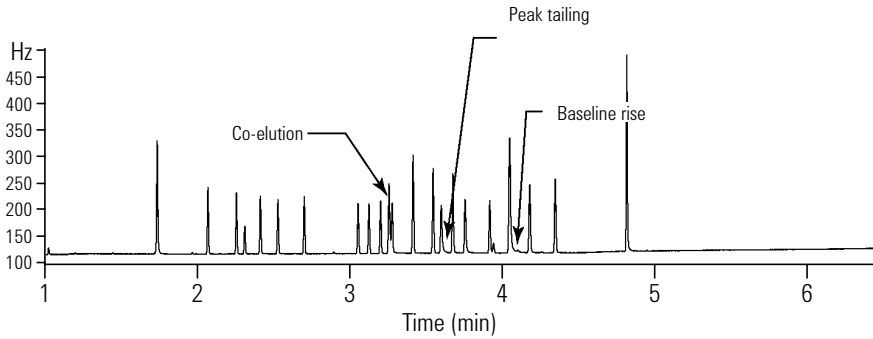
**Agilent, DB-XLB confirmatory column** Agilent Part No. 121-1222



**Agilent’s DB-XLB confirmatory analysis column** resolved 20 peaks of interest in less than 6 minutes (the remaining peaks were close to being baseline resolved and sufficient for peak confirmation.).

Experimental conditions are listed on the following page.

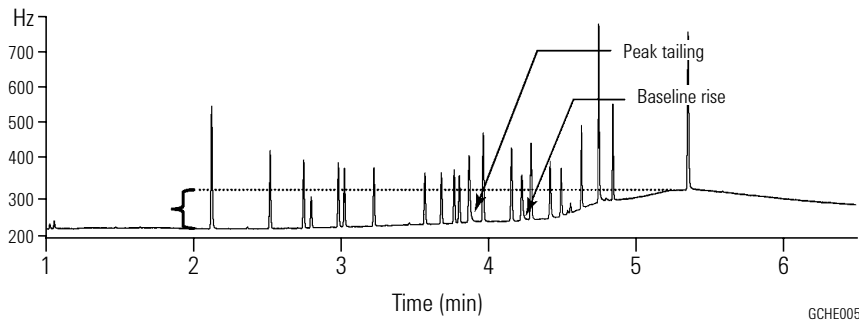
## Restek primary column



## Experimental Conditions:

Carrier	Hydrogen (69 cm/sec at 120° C, ramped at 99 mL/min to 106 cm/sec at 4.4 minutes)
Oven	120° C (0.32 min); 120° C/min to 160° C; 30° C/min to 258° C (0.18 min); 38.81° C/min to 300° C (1.5 min)
Injection	Split/splitless; 220° C, pulsed splitless (35 psi for 0.5 min, purge flow of 40 mL/min on at 1 minute, gas saver flow 20 ml/min on 3 minutes)
Detector	μECD 320° C; nitrogen makeup; constant column + makeup flow 60 mL/min

## Restek confirmatory column



- |                         |                        |
|-------------------------|------------------------|
| 1. Tetrachloro-m-xylene | 12. 4,4' DDE           |
| 2. Alpha BHC            | 13. Dieldrin           |
| 3. Gamma BHC            | 14. Endrin             |
| 4. Beta BHC             | 15. 4,4' DDD           |
| 5. Delta BHC            | 16. Endosulfan II      |
| 6. Heptachlor           | 17. 4,4' DDT           |
| 7. Aldrin               | 18. Endrin Aldehyde    |
| 8. Heptachlor Epoxide   | 19. Endosulfan Sulfate |
| 9. Gamma Chlordane      | 20. Methoxychlor       |
| 10. Alpha Chlordane     | 21. Endrin Ketone      |
| 11. Endosulfan I        | 22. Decachlorobiphenyl |

Restek's confirmatory column resolved all 22 peaks of interest; however there is evidence of peak tailing, as well as an unacceptable level of temperature-dependent baseline drift. Compare that to Agilent's results, which show sharp, symmetrical peaks and minimal temperature-dependent baseline drift.

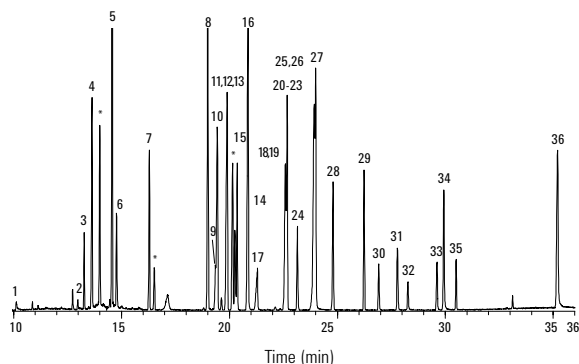


# Proven speed and accuracy for target analytes

The following examples confirm that Agilent J&W GC/MS columns deliver results you can be sure of for both routine and difficult sample types.

## Herbicide analysis using DB-XLB (30 m x 0.25 mm x 0.25 µm) Agilent Part No.122-1232

- |                   |                  |
|-------------------|------------------|
| 1. Monuron        | 20. Ametryne     |
| 2. Diuron         | 21. Prometryne   |
| 3. EPTC           | 22. Simetryn     |
| 4. Dichlobenil    | 23. Metribuzin   |
| 5. Vernolate      | 24. Terbutryn    |
| 6. Pebulate       | 25. Metolachlor  |
| 7. Molinate       | 26. Bromacil     |
| 8. Sulfallate     | 27. Dacthal      |
| 9. Atraton        | 28. Diphenamid   |
| 10. Prometon      | 29. Butachlor    |
| 11. Atrazine      | 30. Napropamide  |
| 12. Propazine     | 31. Carboxin     |
| 13. Simazine      | 32. Tricyclazole |
| 14. Terbutylazine | 33. Norflurazon  |
| 15. Pronamide     | 34. Hexazinone   |
| 16. Secbumeton    | 35. Difolotan    |
| 17. Terbacil      | 36. Fluridone    |
| 18. Alachlor      | *Impurity        |
| 19. Propanil      |                  |



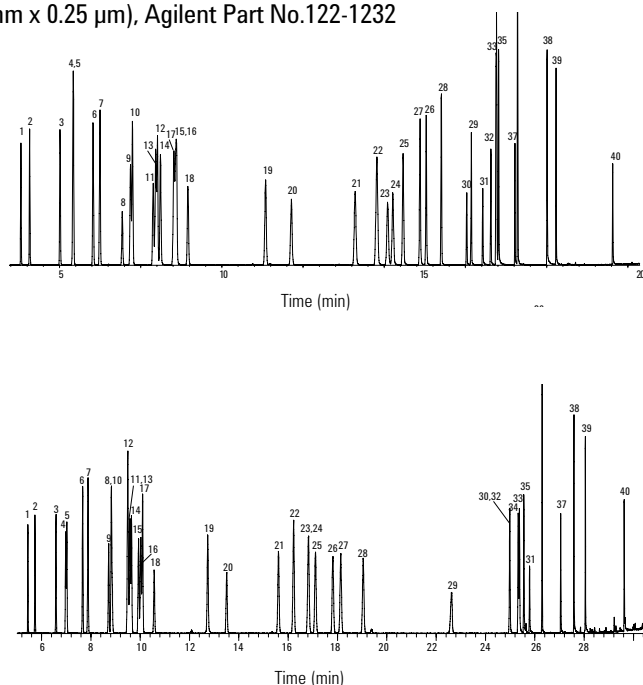
This chromatogram shows the excellent resolution of 36 herbicides using a DB-XLB column. DB-XLB utilize a proprietary second generation arylene technology giving these columns an upper temperature of 360° C while exhibiting minimal column bleed. This increase in thermal stability results in improved sensitivity for late eluting analytes.

### Experimental Conditions:

Column	DB-XLB 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-1232
Carrier	Helium at 32 cm/sec, measured at 50° C
Oven	50° C for 1 min 50-180° C at 10°/min 180-230° C at 5°/min 230-320° C at 10°/min 320° C for 2 min
Injector	Splitless, 250° C 30 sec purge activation time 2 µL x 10-50 ng/µL solution in acetone
Detector	MSD, 50-400 full scan Transfer line 300° C

## Phenol analysis using DB-5ms and DB-XLB columns DB-5ms (30 m x 0.25 mm x 0.25 µm), Agilent Part No.122-5532 DB-XLB (30 m x 0.25 mm x 0.25 µm), Agilent Part No.122-1232

- |                                    |
|------------------------------------|
| 1. Phenol                          |
| 2. 2-Chlorophenol                  |
| 3. 2-Methylphenol                  |
| 4. 4-Methylphenol                  |
| 5. 3-Methylphenol                  |
| 6. 2-Chloro-5-methylphenol         |
| 7. 2,6-Dimethylphenol              |
| 8. 2-Nitrophenol                   |
| 9. 2,4-Dimethylphenol              |
| 10. 2,5-Dimethylphenol             |
| 11. 2,4-Dichlorophenol             |
| 12. 2,3-Dimethylphenol             |
| 13. 2,5-Dichlorophenol             |
| 14. 2,3-Dichlorophenol             |
| 15. 2-Chlorophenol                 |
| 16. 4-Chlorophenol                 |
| 17. 3,4-Dimethylphenol             |
| 18. 2,6-Dichlorophenol             |
| 19. 4-Chloro-2-methylphenol        |
| 20. 4-Chloro-3-methylphenol        |
| 21. 2,3,5-Trichlorophenol          |
| 22. 2,4-Dibromophenol              |
| 23. 2,4,6-Trichlorophenol          |
| 24. 2,4,5-Trichlorophenol          |
| 25. 2,3,4-Trichlorophenol          |
| 26. 3,5-Dichlorophenol             |
| 27. 2,3,6-Trichlorophenol          |
| 28. 3,4,-Dichlorophenol            |
| 29. 3-Nitrophenol                  |
| 30. 2,5-Dinitrophenol              |
| 31. 2,4-Dinitrophenol              |
| 32. 4-Nitrophenol                  |
| 33. 2,3,5,6-Tetrachlorophenol      |
| 34. 2,3,4,5-Tetrachlorophenol      |
| 35. 2,3,4,6-Tetrachlorophenol      |
| 36. 3,4,5-Trichlorophenol          |
| 37. 2-Methyl-4,6-dinitrophenol     |
| 38. Pentachlorophenol              |
| 39. Dinoseb                        |
| 40. 2-Cyclohexyl-4,6-dinitrophenol |



Good separation of phenols was achieved with DB-5ms and DB-XLB columns. Both columns exhibit excellent low bleed characteristics, inertness, and robustness – which make them well-suited to the phenol analysis, including active phenols (e.g. nitro-group substituents) which are well-known to be active or difficult compounds that are easily degraded or “lost” in the GC flow path.

### Experimental Conditions:

Column	DB-5ms 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-5532
Column	DB-XLB 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-1232
Carrier	He at 1.2 ml/min Constant Flow
Oven	40° C for 2.00 min 40-100° C at 40° C/ min 100° C for 0.50 min 100-140° C at 2° C/min 140-340° C at 30° C/min
Injector	Pulsed Splitless, 200° C Pulse Pressure & Time: 25.0 psi for 1.00 min Purge Flow & Time: 50.0 ml/min for 0.25 min Gas Saver Flow & Time: 20.0 ml/min for 3.00 min
Detector	MSD Transfer Line Temp at 320° C Quadrapole at 150° C Source at 230° C

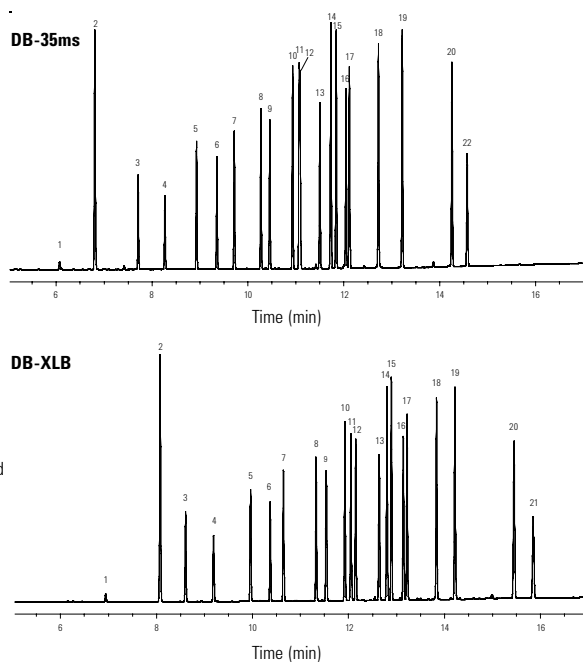
## PCB analysis by EPA Method 8082

**DB-35ms** (30 m x 0.32 mm x 0.25  $\mu$ m), Agilent Part No.123-3832

**DB-XLB** (30 m x 0.32 mm x 0.50  $\mu$ m), Agilent Part No.123-1236

1. IUPAC 1
2. Tetrachloro-m-xylene (IS/SS)
3. IUPAC 5
4. IUPAC 18
5. IUPAC 31
6. IUPAC 52
7. IUPAC 44
8. IUPAC 66
9. IUPAC 101
10. IUPAC 87
11. IUPAC 110
12. IUPAC 151
13. IUPAC 153
14. IUPAC 141
15. IUPAC 137
16. IUPAC 187
17. IUPAC 183
18. IUPAC 180
19. IUPAC 170
20. IUPAC 206
21. Decachlorobiphenyl (IS/SS)

IS/SS - Internal Standard/Surrogate Standard



*Rapid analysis of PCBs with arylene-phase column pair (primary DB-35ms and conformation DB-XLB) and GC/ECD. The column pair enables baseline resolution of all EPA Method 8082 analytes under 16 minutes. The increased sensitivity and upper temperature limit of 340/360° C of these columns provide a much improved signal-to-noise ratio, shorter analysis times, and longer column lifetime without excess bake out.*

### Experimental Conditions:

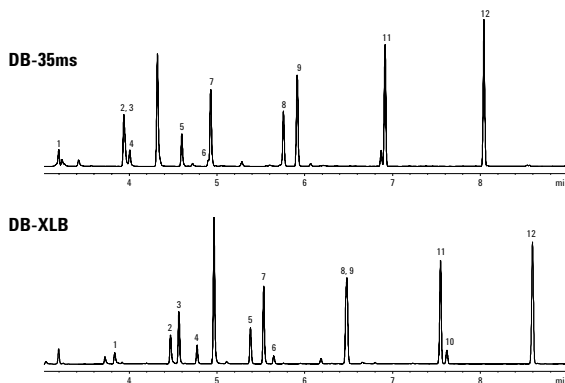
Column	DB-35ms 30 m x 0.32 mm x 0.25 $\mu$ m Agilent Part No.123-3832
Column	DB-XLB 30 m x 0.32 mm x 0.50 $\mu$ m Agilent Part No.123-1236
Carrier	Helium at 45 cm/sec (EPC in constant flow mode)
Oven	110° C for 0.5 min 110-320° C at 15° C/min 320° C for 5 min
Injector	Splitless, 250° C 30 sec purge activation time 50 pg per component
Detector	$\mu$ ECD, 350° C Nitrogen makeup gas (column + makeup flow = 30 mL/min constant flow)

## Analysis of Haloacetic Acids by EPA Method 552.2

**DB-35ms** (30 m x 0.32 mm x 0.25  $\mu$ m), Agilent Part No.123-3832

**DB-XLB** (30 m x 0.32 mm 0.50  $\mu$ m), Agilent Part No.1123-1236

1. Chloroacetic acid
2. Bromoacetic acid
3. Dichloroacetic acid
4. Dalapon
5. Trichloroacetic acid
6. 1,2,3-Trichloropropane (IS)
7. Bromochloroacetic acid
8. Bromodichloroacetic acid
9. Dibromoacetic acid
10. 2,3-Dibromopropionic acid (SS)
11. Chlorodibromoacetic
12. Tribromoacetic acid



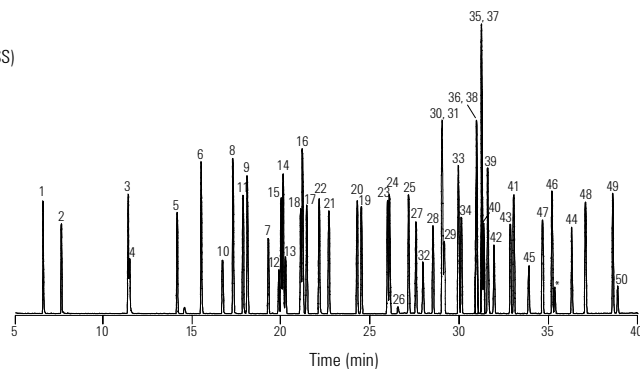
*Primary column DB-35ms and conformation column DB-XLB provides excellent identification and confirmation capabilities for haloacetic acids found in EPA Method 552.2*

### Experimental Conditions:

Column	DB-35ms 30 m x 0.32 mm x 0.25 $\mu$ m film thickness Agilent Part No.123-3832
Column	DB-XLB 30 m x 0.32 mm x 0.50 $\mu$ m film thickness Agilent Part No.1123-1236
Carrier	Helium at 45 cm/sec (EPC in constant flow mode) measured at 50° C
Oven	40° C for 0.5 min 40-200° C at 15°/min 200° C for 2 min
Injector	Splitless, 250° C 30 sec purge activation time 50 pg per component
Detector	$\mu$ ECD, 350° C Nitrogen makeup gas (column + makeup flow = 30 mL/min constant flow)

## Organochlorine Pesticide Analysis by EPA Method 8081A DB-35ms (30 m x 0.25 mm x 0.25 μm), Agilent Part No.122-3832

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro-m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal™
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor



Here shows the analysis of 50 common chlorinated pesticides found in EPA Method 8081 using DB-35ms. Baseline resolution of all analytes is easily achieved.

- |                      |                            |                         |
|----------------------|----------------------------|-------------------------|
| 30. α-Chlordane      | 39. p,p'-DDD               | 48. Mirex™              |
| 31. Endosulfan I     | 40. Endosulfan II          | 49. cis-Permethrin      |
| 32. Captan           | 41. p,p'-DDT               | 50. trans-Permethrin    |
| 33. p,p'-DDE         | 42. Endrin aldehyde        | * Breakdown Products    |
| 34. Dieldrin         | 43. Endosulfan sulfate     | SS - Surrogate Standard |
| 35. Chlorobenzilate™ | 44. Dibutylchlorodate (SS) | IS - Internal Standard  |
| 36. Perthane™        | 45. Captafol               |                         |
| 37. Chloropropylate  | 46. Methoxychlor           |                         |
| 38. Endrin           | 47. Endrin ketone          |                         |

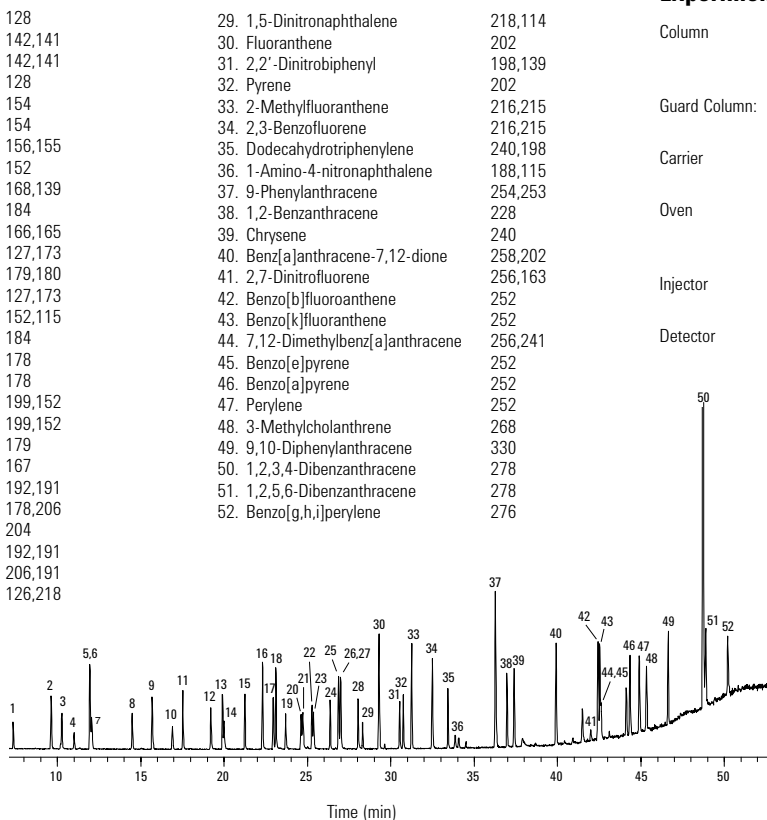
### Experimental Conditions:

Column	DB-35ms 30 m x 0.25 mm x 0.25 μm Agilent Part No.122-3832
Carrier	Helium at 35 cm/sec, measured at 50° C
Oven	50° C for 1 min 50-100° C at 25°/min 100-300° C at 5°/min 300° C for 5 min
Injector	Splitless, 250° C 30 sec purge activation time 1 μL of 35 μg/mL composite 8081A standards, Accustandard Inc.
Detector	MSD, 300° C transfer line full scan at m/z 50-500

Standards used were a composite of individual solutions supplied courtesy of Accustandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

## PAH analysis using DB-17ms columns (30 m x 0.25 mm x 0.25 μm) Agilent Part No.122-4732

Name	Ion
1. Naphthalene	128
2. 2-Methylnaphthalene	142,141
3. 1-Methylnaphthalene	142,141
4. Azulene	128
5. Acenaphthene	154
6. Biphenyl	154
7. 2,6-Dimethylnaphthalene	156,155
8. Acenaphthalene	152
9. Dibenzofuran	168,139
10. Dibenzo-p-dioxin	184
11. Fluorene	166,165
12. 1-Nitronaphthalene	127,173
13. 9,10-Dihydroanthracene	179,180
14. 2-Nitronaphthalene	127,173
15. 2-Nitrobiphenyl	152,115
16. Dibenzothiophene	184
17. Phenanthrene	178
18. Anthracene	178
19. 3-Nitrobiphenyl	199,152
20. 4-Nitrobiphenyl	199,152
21. 5,6-Benzoquinoline	179
22. Carbazole	167
23. 2-Methylantracene	192,191
24. 1,2,3,4-Tetrahydrofluoranthene	178,206
25. 2-Phenylnaphthalene	204
26. 9-Methylantracene	192,191
27. 3,6-Dimethylphenanthrene	206,191
28. 1,3-Dinitronaphthalene	126,218



DB-17ms is an excellent column for PAH analysis where good separation was achieved for 52 PAHs.

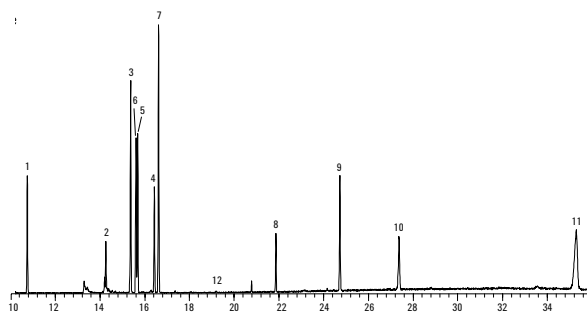
### Experimental Conditions:

Column	DB-17ms 30 m x 0.25 mm x 0.25 μm Agilent Part No.122-4732
Guard Column:	1 m x 0.53 mm Agilent Part No.160-2535
Carrier	Helium at: 34.1 cm/sec, measured at 150° C
Oven	95° C for 0.5 min 95-340° C at 5°/min 340° C for 5 min
Injector	Split 1:40, 300° C 2 μL, PAH standard
Detector	MSD, 340° C transfer line Scan 80-330 amu

## Hallucinogen detection using DB-17ms columns (30 m x 0.25 mm x 0.25 µm)

Agilent Part No.122-4732

1. 4-Methylaminorex
2. Mescaline
3. Dimethyltryptamine
4. Ketimine
5. TCP (Tenocyclidine)
6. PCP
7. Diethyltryptamine
8. Bufotenine
9. Fentanyl
10. Ibogaine
11. LSD
12. Psilocin (peak not shown)



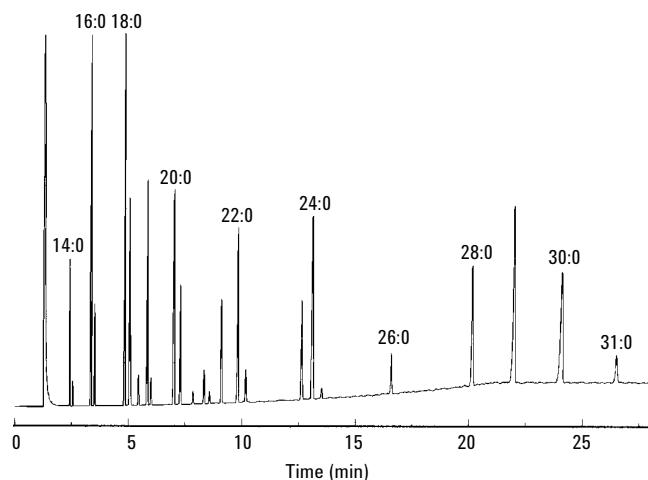
GC/MS has become a common tool in identifying illicit drugs seized by law enforcement agencies. In this example, a DB-17ms column successfully separated 12 hallucinogens.

### Experimental Conditions:

Column	DB-17ms 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-4732
Carrier	Helium at 30 cm/sec, measured at 50° C
Oven	50° C for 0.5 min 50-125° C at 25°/min 125-255° C at 10°/min 255-320° C at 25°/min 320° C for 16 min
Injector	Splitless, 250° C 30 sec purge activation time 1 µL of 10-50 ng/µL standard in methanol
Detector	MSD, 300° C transfer line full scan at m/z 40-350

## FAME analysis using DB-225ms columns (30 m x 0.25 mm x 0.25 µm)

Agilent Part No.122-2932



As you can see, the higher isothermal upper temperature limit of DB-225ms columns (260° C vs. 220° C for DB-225 columns) allows the elution of higher molecular weight FAMES (above 24:0) while maintaining a reasonable run time.

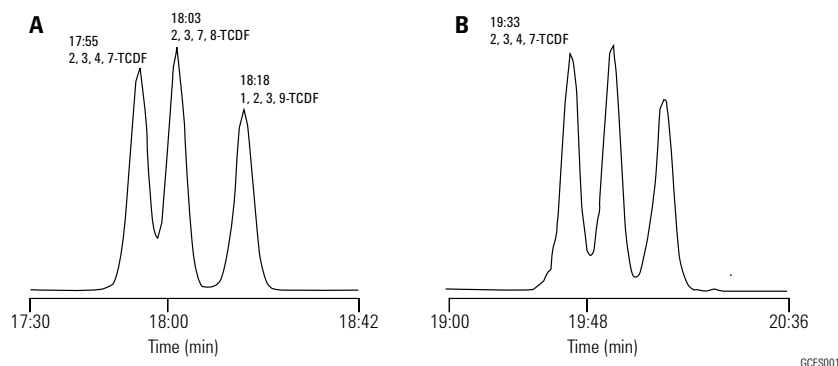
### Experimental Conditions:

Column	DB-225ms 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-2932
Carrier	Hydrogen at 40 cm/sec
Oven	200° C for 1 min 200-260° C at 3°/min
Injector	Split 1:50, 250° C
Detector	FID Nitrogen make-up gas at 30 mL/min

## Comparative analysis of 2-Tetrachlorodibenzo-p-furans using DB-225 and DB-225ms columns

DB-225 (30 m x 0.25 mm x 0.25 µm), Agilent Part No.122-2232

DB-225ms (30 m x 0.25 mm x 0.25 µm), Agilent Part No.122-2932



Note the separation between 2,3,7,8-TCDF and 2,3,4,7-TCDF on the DB-225 column is also easily achievable and actually better on the DB-225ms column.

### Experimental Conditions:

Column A:	DB-225 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-2232
Column B:	DB-225ms 30 m x 0.25 mm x 0.25 µm Agilent Part No.122-2932
Carrier	Helium at 12 mL/min
Oven	160-250° C at 7°/min 250° C until compounds elute
Injector	Splitless, 240° C
Detector	VG Autospec Ultima

Agilent offers the industry's **widest column portfolio** engineered for low bleed, high thermal stability, and excellent inertness.

**Applications:** Semivolatiles, halogenated compounds, pesticides, herbicides, drugs of abuse, amines, unknown sample screen

#### Ultra Inert 5ms Capillary GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-5ms Ultra Inert</b>			
0.18	20	0.18	121-5522UI
		0.36	121-5523UI
0.25	15	0.25	122-5512UI
		1.00	122-5513UI
	25	0.25	122-5522UI
		0.25	122-5532UI
	30	0.50	122-5536UI
		1.00	122-5533UI
		1.00	122-5552UI
	60	0.25	122-5562UI
1.00		122-5563UI	
0.32	30	0.25	123-5532UI
		0.50	123-5536UI
		1.00	123-5533UI
	60	1.00	123-5563UI
<b>HP-5ms Ultra Inert</b>			
0.18	20	0.18	19091S-577UI
0.25	15	0.25	19091S-431UI
		0.25	19091S-433UI
	30	0.50	19091S-133UI
		1.00	19091S-233UI
60	0.25	19091S-436UI	
	0.25	19091S-413UI	
0.32	30	1.00	19091S-213UI

**Applications:** Amines, hydrocarbons, pesticides, PCBs, phenols, sulfur compounds, flavors and fragrances

#### Ultra Inert 1ms Capillary GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-1ms Ultra Inert</b>			
0.18	20	0.18	121-0122UI
0.25	15	0.25	122-0112UI
	30	0.25	122-0132UI
	60	0.25	122-0162UI
0.32	15	0.25	123-0112UI
	30	0.25	123-0132UI
<b>HP-1ms Ultra Inert</b>			
0.18	20	0.18	19091S-677UI
0.25	15	0.25	19091S-931UI
		0.25	19091S-933UI
	30	0.50	19091S-633UI
		1.00	19091S-733UI
0.32	15	0.25	19091S-911UI
		0.52	19091S-612UI
	30	0.25	19091S-913UI
		1.00	19091S-713UI

**Applications:** CLP Pesticides, Nitrogen Herbicides, PCBs, 508.1 Pesticides, Aromatic Hydrocarbons, Drugs of Abuse, Confirmation Column Analysis

### Ultra Inert 35ms GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-35ms Ultra Inert</b>			
0.18	20	0.18	121-3822UI
0.25	15	0.25	122-3812UI
0.25	30	0.25	122-3832UI
0.32	15	0.25	123-3812UI
0.32	30	0.25	123-3832UI

**Applications:** Amines, hydrocarbons, pesticides, PDBs, phenols, sulfur compounds, flavors and fragrances

### DB-1ms

ID (mm)	Length (m)	Film (µm)	Part No.
0.10	10	0.10	127-0112
		0.40	127-0113
		0.10	127-0122
		0.40	127-0123
0.18	20	0.18	121-0122
0.20	12	0.33	128-0112
	25	0.33	128-0122
0.25	15	0.25	122-0112
	30	0.10	122-0131
		0.25	122-0132
	60	0.25	122-0162
0.32	15	0.25	123-0112
		0.10	123-0131
		0.25	123-0132
	60	0.25	123-0162

**Applications:** Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides

### DB-5ms

ID (mm)	Length (m)	Film (µm)	Part No.
0.18	20	0.18	121-5522
		0.36	121-5523
		0.18	121-5542
0.20	12	0.33	128-5512
	25	0.33	128-5522
	50	0.33	128-5552
0.25	15	0.10	122-5511
		0.25	122-5512
		0.50	122-5516
		1.00	122-5513
	25	0.25	122-5522
		0.40	122-552A
		30	0.10
0.25	122-5532		
0.50	122-5536		
1.00	122-5533		
50	0.25	122-5552	
60	0.10	0.10	122-5561
		0.25	122-5562
		1.00	122-5563

**Applications:** Amines, hydrocarbons, pesticides, PDBs, phenols, sulfur compounds, flavors and fragrances

### HP-1ms

ID (mm)	Length (m)	Film ( $\mu\text{m}$ )	Part No.
0.18	20	0.18	19091S-677
0.20	25	0.33	19091S-602
0.25	15	0.25	19091S-931
		0.10	19091S-833
		0.25	19091S-933
		0.50	19091S-633
		1.00	19091S-733
60	0.25	0.25	19091S-936
		0.25	19091S-911
		0.52	19091S-612
		0.25	19091S-913
		1.00	19091S-713
60	0.25	19091S-916	

**Applications:** Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides

### DB-5ms

ID (mm)	Length (m)	Film ( $\mu\text{m}$ )	Part No.		
0.32	15	0.10	123-5511		
		0.25	123-5512		
		1.00	123-5513		
	25	0.52	0.52	123-5526	
			30	0.10	123-5531
				0.25	123-5532
	60	1.00	0.50	123-5536	
			1.00	123-5533	
			0.10	0.10	123-5561
				0.25	123-5562
0.53	30	0.50	123-5566		
		1.00	123-5563		
		1.50	125-5512		
		1.50	125-5537		
0.53	1.00	1.00	125-553J		
		1.50	125-5532		

**Applications:** Semivolatiles, alkaloids, drugs, FAMES, halogenated compounds, pesticides, herbicides

### HP-5ms

ID (mm)	Length (m)	Film ( $\mu\text{m}$ )	Part No.	
0.18	20	0.18	19091S-577	
0.20	12	0.33	19091S-101	
	25	0.33	19091S-102	
	50	0.33	19091S-105	
0.25	15	0.10	19091S-331	
		0.25	19091S-431	
		1.00	19091S-231	
	30	0.10	0.10	19091S-333
			0.25	19091S-433
			0.50	19091S-133
			1.00	19091S-233
	60	0.10	0.10	19091S-336
			0.25	19091S-436
0.32	25	0.52	19091S-112	
	30	0.10	19091S-313	
		0.25	19091S-413	
		0.50	19091S-113	
	60	1.00	1.00	19091S-213
			0.25	19091S-416

**Applications:** PCB Congener Analysis (209 Congeners)  
CLP Pesticides, Chlorinated Herbicides, PCBs, 508.1  
Pesticides

### DB-XLB

ID (mm)	Length (m)	Film (µm)	Part No.
0.18	20	0.18	121-1222
	30	0.18	121-1232
0.20	12	0.33	128-1212
	25	0.33	128-1222
0.25	15	0.10	122-1211
		0.25	122-1212
	30	0.10	122-1231
		0.25	122-1232
		0.50	122-1236
		1.00	122-1233
0.32	30	0.25	123-1232
	60	0.25	123-1262
0.53	15	1.50	125-1212
	30	1.50	125-1232

**Applications:** CLP Pesticides, Chlorinated Herbicides,  
PCBs 508.1 Pesticides

### DB-35ms

ID (mm)	Length (m)	Film (µm)	Part No.
0.18	20	0.18	121-3822
0.20	15	0.33	128-3812
	25	0.33	128-3822
0.25	15	0.25	122-3812
		0.15	122-3831
	30	0.25	122-3832
		0.25	122-3862
0.32	15	0.25	123-3812
	30	0.25	123-3832
	30	0.50	125-3837
		1.00	125-3832

**Applications:** Drugs, glycols, pesticides, steroids

### DB-17ms

ID (mm)	Length (m)	Film (µm)	Part No.
0.18	20	0.18	121-4722
0.25	15	0.15	122-4711
		0.25	122-4712
	30	0.15	122-4731
		0.25	122-4732
	60	0.25	122-4762
	0.32	15	0.25
30		0.25	123-4732

**Applications:** FAMES, alditol, acetates, neutral sterols

### DB-225ms

ID (mm)	Length (m)	Film (µm)	Part No.
0.25	15	0.25	122-2912
	30	0.25	122-2932
	60	0.25	122-2962
0.32	30	0.25	123-2932

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Printed in the U.S.A. November 16, 2010.  
5990-3758EN



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